

**REMARKS**

Applicants concurrently file herewith an Excess Claim Fee Payment Letter, and corresponding excess claim fee, for one (1) excess independent claim and five (5) excess total claims.

Claims 1-25 are all the claims presently pending in the application. Claims 1-5, 7-11, 13-15 and 17-19 have been merely editorially amended and have not been substantively amended to more particularly define the invention. Claims 21-25 have been added to claim additional features of the invention and to provide more varied protection for the claimed invention.

It is noted that the claim amendments are made only for more particularly pointing out the invention, and not for distinguishing the invention over the prior art, narrowing the claims or for any statutory requirements of patentability. Further, Applicants specifically state that no amendment to any claim herein should be construed as a disclaimer of any interest in or right to an equivalent of any element or feature of the amended claim.

Claims 1-20 stand rejected under 35 U.S.C. §102(b) as being anticipated by Russell et al. (U.S. Patent No. 6,103,540; hereinafter "Russell").

This rejection is respectfully traversed in the following discussion.

**I. THE CLAIMED INVENTION**

The claimed invention (e.g., as defined by exemplary claim 1) is directed to a nanosilicon light-emitting element. The nanosilicon light-emitting element includes an amorphous SiO<sub>x</sub> film including a mixture of silicon atoms and oxygen atoms formed on a semiconductor substrate. The amorphous SiO<sub>x</sub> film is heat treated in an inert gas to form the silicon atoms into nanosilicon of about 3.0nm or less. The amorphous SiO<sub>x</sub> film including the nanosilicon is treated with an aqueous solution of hydrofluoric acid and subjected to

thermal oxidation to allow at least one of three primary colors of light to be emitted at a low operating voltage at room temperature.

In conventional nanosilicon light-emitting elements it has been difficult to reduce the size of the nanosilicon crystals in a stable manner, to emit light under a low voltage and to emit blue light clearly and in a stable manner.

The claimed invention of exemplary claim 1, on the other hand, is directed to a nanosilicon light-emitting element including an amorphous SiO<sub>x</sub> film including a mixture of silicon atoms and oxygen atoms formed on a semiconductor substrate. The amorphous SiO<sub>x</sub> film is heat treated in an inert gas to form the silicon atoms into nanosilicon of about 3.0nm or less. The amorphous SiO<sub>x</sub> film including the nanosilicon is treated with an aqueous solution of hydrofluoric acid and subjected to thermal oxidation to allow at least one of three primary colors of light to be emitted at a low operating voltage at room temperature (e.g., see Application at page 3, lines 12-20). The claimed invention allows for long-lasting and high-intensity red, green and blue light to be emitted at room temperature (see Application at page 3, lines 1-4).

## II. THE PRIOR ART REFERENCE

The Examiner alleges that Russell teaches the claimed invention of claims 1-20. Applicants respectfully submit, however, that there are features of the claimed invention that are neither taught nor suggested by Russell.

That is, Russell does not teach or suggest a nanosilicon light-emitting element including “*an amorphous SiO<sub>x</sub> film comprising a mixture of silicon atoms and oxygen atoms formed on a semiconductor substrate*”, as recited in claim 1 and similarly recited in claims 2, 7 and 8.

The Examiner attempts to rely on Figures 1, 4 and 5, and the corresponding text of

Russell to support his allegations. The Examiner, however, is clearly incorrect.

That is, nowhere in these figures nor this passage (nor anywhere else for that matter) does Russell teach or suggest a nanosilicon light-emitting element wherein an amorphous SiO<sub>x</sub> film including a mixture of silicon atoms and oxygen atoms is formed on a semiconductor substrate. Indeed, Russell does not even mention an amorphous SiO<sub>x</sub> film.

Russell merely teaches depositing silicon on an insulating substrate base (see Russell at column 4, lines 21-22). In stark contrast, the claimed invention recites an amorphous SiO<sub>x</sub> film formed on a semiconductor substrate.

Furthermore, Russell does not teach or suggest “*said amorphous SiO<sub>x</sub> film being heat treated in an inert gas to form the silicon atoms into nanosilicon*”, as recited in claim 1, and similarly recites in claims 2, 7 and 8.

Indeed, Russell does not even mention heat treating, let alone teach or suggest forming nanosilicon through heat treatment in an inert gas, as recited by the claimed invention. Russell clearly teaches that single crystal silicon of a thickness of 0.3 micrometers is deposited on a sapphire substrate by the pyrolysis of silane. Even assuming, *arguendo*, that deposition through pyrolysis teaches forming nanosilicon through heat treatment, nowhere does Russell teach or suggest that the pyrolysis is conducted in an inert gas.

Furthermore, the claimed invention clearly recites that the amorphous SiO<sub>x</sub> film is heat treated in an inert gas to form nanosilicon. In stark contrast, Russell teaches forming nanosilicon crystals through the pyrolysis of silane. Silane has a chemical composition of SiH<sub>4</sub>, not SiO<sub>x</sub>.

Moreover, Russell does not teach or suggest “*wherein said amorphous SiO<sub>x</sub> film including said nanosilicon is treated with an aqueous solution of hydrofluoric acid*”, as recited in claim 1, and similarly recited in claims 2, 7 and 8. Indeed, Russell does not even mention, let alone teach or suggest a hydrofluoric acid treatment.

Therefore, Applicants respectfully submit that Russell does not teach or suggest each and every feature of the claimed invention. Therefore, the Examiner is respectfully requested to reconsider and withdraw this rejection.

### **III. NEW CLAIMS**

New claims 21-25 have been added to provide more varied protection for the claimed invention and to claim additional features of the invention. Applicants respectfully submit that these claims are independently patentable based on the patentable features recited therein.

Applicants respectfully submit that newly added claims 21-25 are patentable at least based on analogous reasons to those set forth above with respect to claims 1-20.

### **IV. STATEMENT OF SUBSTANCE OF INTERVIEW**

As a preliminary matter, Applicants' representative would like to thank the Examiner for courtesies extended in the personal interview conducted on December 14, 2005.

An Examiner's Interview Summary Record (PTOL-413) was provided by the Examiner at the interview on December 14, 2005.

Applicants submit this Statement to comply with the requirements of M.P.E.P. § 713.04.

In the interview, the following was discussed:

#### **A. Identification of claims discussed:**

Claims 1-25.

#### **B. Identification of prior art discussed:**

Russell et al. (U.S. Patent No. 6,103,540).

**C. Identification of principal proposed amendments:**

None.

**D. Brief Identification of principal arguments:**

Applicants' representative respectfully pointed out the differences between the claimed invention and the Russell invention. Specifically, Applicants' representative provided traversal arguments corresponding to the traversal arguments provided above.

That is, Applicants' representative pointed out that Russell does not teach or suggest a nanosilicon light-emitting element including "*an amorphous SiO<sub>x</sub> film comprising a mixture of silicon atoms and oxygen atoms formed on a semiconductor substrate*", as recited in claim 1 and similarly recited in claims 2, 7 and 8.

**E. Results of the Interview:**

In response to the arguments presented, the Examiner indicated that the proposed traversal arguments and editorially amendments to the original claims would overcome the rejection based on the Russell reference.

The Examiner further indicated that a further prior art search would be needed to determine the patentability of claims 1-25.

**F. Conclusion:**

Applicants respectfully submit that Russell does not teach or suggest each and every element of the claimed invention.

**V. FORMAL MATTERS AND CONCLUSION**


In view of the foregoing, Applicants submit that claims 1-25, all of the claims presently pending in the application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to Attorney's Deposit Account No. 50-0481.

Respectfully Submitted,

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